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Waris Qidwai

*Aga Khan University*, [waris.qidwai@aku.edu](mailto:waris.qidwai@aku.edu)

Riaz Qureshi

*Aga Khan University*

Iqba Azam

*Aga Khan University*, [iqbal.azam@aku.edu](mailto:iqbal.azam@aku.edu)

Syed Najmul Hasan

*Aga Khan University*

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# Effect of Dietary Garlic (*Allium Sativum*) on the Blood Pressure in Humans - A Pilot Study

Waris Qidwai, Riaz Qureshi, Syed Iqbal Azam ( Family Medicine Division, Department of Community Health Sciences, The Aga Khan University, Karachi. )

Syed Najmul Hasan ( Family Medicine Division, Community Health Centre, The Aga Khan University, Karachi. )

## Abstract

**Objective:** To find out whether individuals with blood pressures on the lower side consume more garlic in their diets. A pilot study to make grounds for more elaborate future trials.

**Method:** A questionnaire was developed in order to estimate the dietary intake of garlic per person per month and to record three blood pressure readings on each individual. It was administered to 101 adult subjects, presenting to the Family Practice Centre of a hospital in the city of Karachi, Pakistan. The various demographic parameters including age, sex, marital status and education were recorded. Those subjects found to be overweight, with known history of hypertension, diabetes mellitus, ischaemic heart disease, and smoking and on medications, which effect blood pressure, were excluded from the study. This was done to remove the effect of confounding variables on Blood Pressure. The data was entered into the epi-info program and the analysis was done using the SPSS software.

**Results:** An average garlic use of 134 grams per case per month was found. 67% of the subjects used garlic in cooked food while the rest used either in the raw form or in pickles. 59% thought that dietary use of garlic is healthy. Subjects with blood pressure on the lower side are found to consume more garlic in their diets. (The mean difference is significant for systolic with p value of 0.05)

**Conclusion:** This study shows that individuals whose blood pressures are on the lower side are more likely to consume more garlic in their diets. (Statistically significant for systolic blood pressure only). This was a pilot study and more elaborate trials are recommended to prove this association (JPMA 50:204, 2000).

## Introduction

Garlic and Onion have been used for millennia in the traditional medical practice of many cultures to treat cardiovascular and other disorders <sup>1</sup>. The strong smelling pungent-tasting bulb of garlic (*Allium Sativum*) is commonly used for flavoring in cooking, all over the world from ancient times. There is a general belief among many patients and most practitioners in the South Asian sub continent that it lowers blood pressure. Even though the biochemical basis for the lowering of blood pressure is known <sup>2</sup>, its impact in real life as well as its therapeutic role in the treatment of hypertension is still a subject for debate.

Despite sonic evidence to suggest beneficial effects of the regular dietary intake of garlic on mild hypertension and hyperlipidaemia <sup>3</sup>, meta-analysis of different studies, to see the effect of garlic on blood pressure suggest that there is insufficient evidence to recommend it as a routine clinical therapy for the treatment of hypertensive subjects <sup>4</sup>. Evidence has been found that people believe continuing garlic use for the management of hypertension is justified, even in the absence of proven beneficial effects<sup>5</sup> Therefore there appears to be acceptability to the use of garlic in the community.

The literature is full of studies on the role of Garlic as regards blood pressure but nothing stands proven despite its widespread use. No study has been done so far to suggest that the daily use of garlic in diet has any beneficial effect on the blood pressure in humans. Local literature is silent on this issue, despite the fact that physicians in Indo-Pakistan sub-continent continue to advise patients to increase the use of garlic in their diets for supposedly beneficial effects on blood pressure in humans. We therefore decided to study whether individuals with blood pressures on the lower side consume more garlic in their diets.

We also studied the perception of the study population whether they considered its use healthy or not and the form in which they took it like raw or cooked.

### **Methodology**

The study was conducted at The Community Health Centre (Family Practice Centre), of The Aga Khan University Hospital, Karachi, Pakistan, in October 1998. A questionnaire was developed to record the garlic consumption in the index case per month.

The questionnaire contained questions on total garlic consumption by the household, number of persons in the household including children between 2 to 8 years age. Number of meals taken outside were asked as well as

The total consumption in the household was divided by the number of subjects. in order to arrive at the average consumption per month for the index case. Children between the age's two to eight years were assumed to consume half as much garlic as an adult. No garlic consumption credit was given to children under two years of age. Three blood pressure readings were recorded at intervals of five minutes, according to standard protocol, and their average was taken for the purpose of this study. Only doctors working at the Health Centre were allowed to administer the questionnaire and record blood pressure.

A sample size of 101 subjects, was calculated by using population standard deviation of garlic use as 95 grams per person per month, with a bound on error of 20 grams per person per month, a level of significance of 5% and a dropout rate of 15%.

Subjects who were overweight, known hypertensives, diabetics, coronary artery disease sufferer, smokers and those on medications which effect their blood pressure were excluded from the study to do away with the effect of possible confounding variables. Those who agreed to participate in the study were asked to sign a consent form. A form on demographic parameters like age, sex, education, occupation and area of residence was also filled.

Descriptive statistics and 95% confidence interval for population means of garlic use were calculated for each factor.

### **Ethics**

The ethics committee of the hospital approved the study.

### **Results**

The socio-demographic features of the study population are shown in Table 1-A and 1-B.

**Table 1-A. Percentage Distribution of Socio-Demographic and Health Related Characteristics, Karachi.**

Characteristics	Percent
<b>Area of Residence</b>	
Karachi Central	16 (15.8)
Karachi East	50 (49.5)
Malir	3 (3.0)
Karachi South	16 (15.8)
Karachi West	5 (5.0)
Interior Sindh	8 (7.9)
Rest of Pakistan	3 (3.0)
<b>Age Group</b>	
<20	6 (6.1)
20-24	13 (13.3)
25-29	11 (11.2)
30-34	14 (14.3)
35-39	13 (13.3)
40-44	14 (14.2)
45-49	8 (8.2)
50 and above	19 (19.4)
<b>Sex</b>	
Male	52 (51.5)
Female	49 (48.5)
<b>Marital Status</b>	
Married	75 (75.0)
Single	25 (25.0)
<b>Education</b>	
No schooling	21 (20.8)
Primary	15 (14.9)
Secondary	12 (11.9)
Matriculate	21 (20.8)
Intermediate/Diploma	15 (14.9)
Graduate	12 (11.9)
Post Graduate	5 (5.0)

**Table 1-B. Percentage Distribution of Socio-Demographic and Health Related Characteristics, Karachi.**

Characteristics	Percent
Private Service	5 (5.2)
Government Service	25 (25.8)
Self Employed	11 (11.3)
Unemployed	5 (5.2)
Student	6 (6.2)
Labourer	3 (3.1)
Others	42 (43.3)
Persons currently living in the household	
1-2	3 (3.0)
3-4	11 (10.9)
5-6	25 (23.7)
7-8	28 (27.7)
9-10	15 (14.9)
11 or more	19 (18.8)
Way of Garlic use	
Only Cooked	67 (66.3)
Cooked+Raw	5 (5.0)
Cooked+Pickle/Chutney/Raita	29 (28.7)
Thought about Garlic Use	
Healthy	59 (58.4)
No Opinion	40 (39.6)
Not Healthy	2 (2.0)
Systolic blood pressure	
<100	6 (6.0)
100-120	65 (65.0)
>120	29 (29.0)
Diastolic blood pressure	
<70	9 (9.0)
70-90	82 (82.0)
>90	9 (9.0)

**Table 2. Mean consumption (in grams) with 95% confidence interval of Garlic by different factors.**

Factors	Mean (SD)	95% Confidence Interval for mean consumption of garlic
<b>Age Group</b>		
<20	117 (34.7)	(80.8, 154.0)
20-34	157 (116.2)	(119.3, 196.0)
35-49	120 (66.1)	(98.0, 143.0)
50 & above	126 (51.4)	101.4, 151.0)
<b>Sex</b>		
Male	131.1 (76.6)	(109.8, 152.5)
Female	137.6 (96.5)	(109.9, 165.3)
<b>Way of Garlic use</b>		
Only Cooked	124.3 (85.1)	(103.5, 145.0)
Others	154.0 (87.0)	(123.6, 184.3)
<b>Thought about Garlic Use</b>		
Healthy	140.0 (84.6)	(118.0, 162.1)
Others	126.2 (89.5)	(98.3, 154.0)
<b>Systolic blood pressure</b>		
<100	231.8 (116.9)	(109.1, 354.4)
100-120	120.1 (82.1)	(99.8, 140.4)
>120	144.7 (78.8)	(114.8, 174.7)
<b>Diastolic blood pressure</b>		
<70	167.5 (109.1)	(83.6, 251.4)
70-90	130.6 (85.8)	(111.8, 149.5)
>90	130.4 (74.2)	(72.9, 187.4)
All	133.9 (86.8)	(117.2, 151.3)

Table 2 shows mean consumption of garlic use with 95 percent confidence interval for different factors. The average garlic use per case per month was 134 grams, while the maximum was 429 grams (two cases). Upto 72% of the subjects were taking three meals at home.

The range of systolic blood pressure in the study subjects was from 80-mmHg to 193-mmHg (6 cases



>160-mm Hg). The range for the diastolic blood pressure was from 60-mmHg to 100-mmHg (9 cases >90-mmHg).

We found that subjects with lower diastolic as well as systolic blood pressure, are more likely to consume more garlic in their diets, (The mean difference is significant at the  $p = 0.05$  level for systolic blood pressure). Those with systolic blood pressure <100 mmHg were consuming 232 grams garlic per month in comparison to those with systolic blood pressure >120 mmHg, who were consuming 148 grams of garlic per month. Those with diastolic blood pressure <70 mmHg were consuming 167 grams of garlic per month, in comparison to those with diastolic >90 mmHg, who were consuming 130 grams per month. (Figures 1 and 2).

### 95 % CONFIDENCE INTERVAL OF GARLIC USE BY SYSTOLIC BLOOD PRESSURE

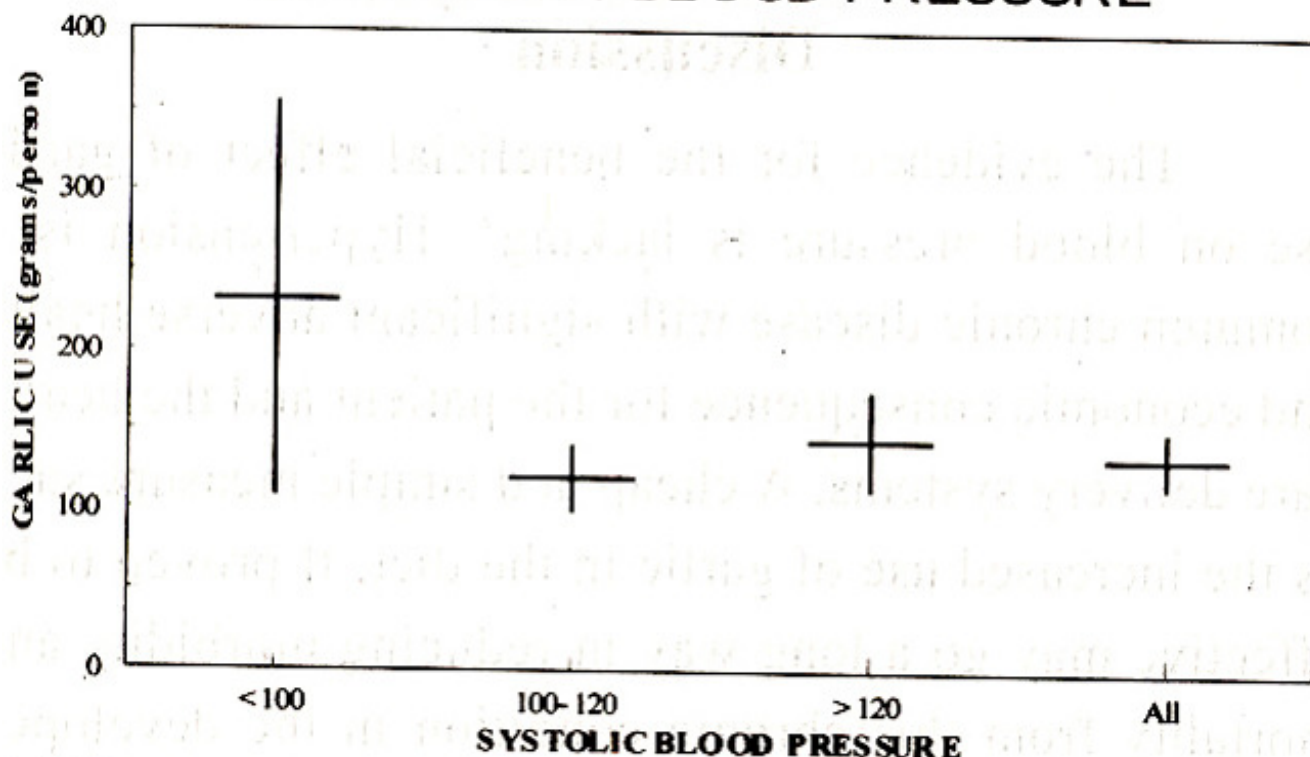


Figure 1.

## 95 % CONFIDENCE INTERVAL OF GARLIC USE BY DIASTOLIC BLOOD PRESSURE

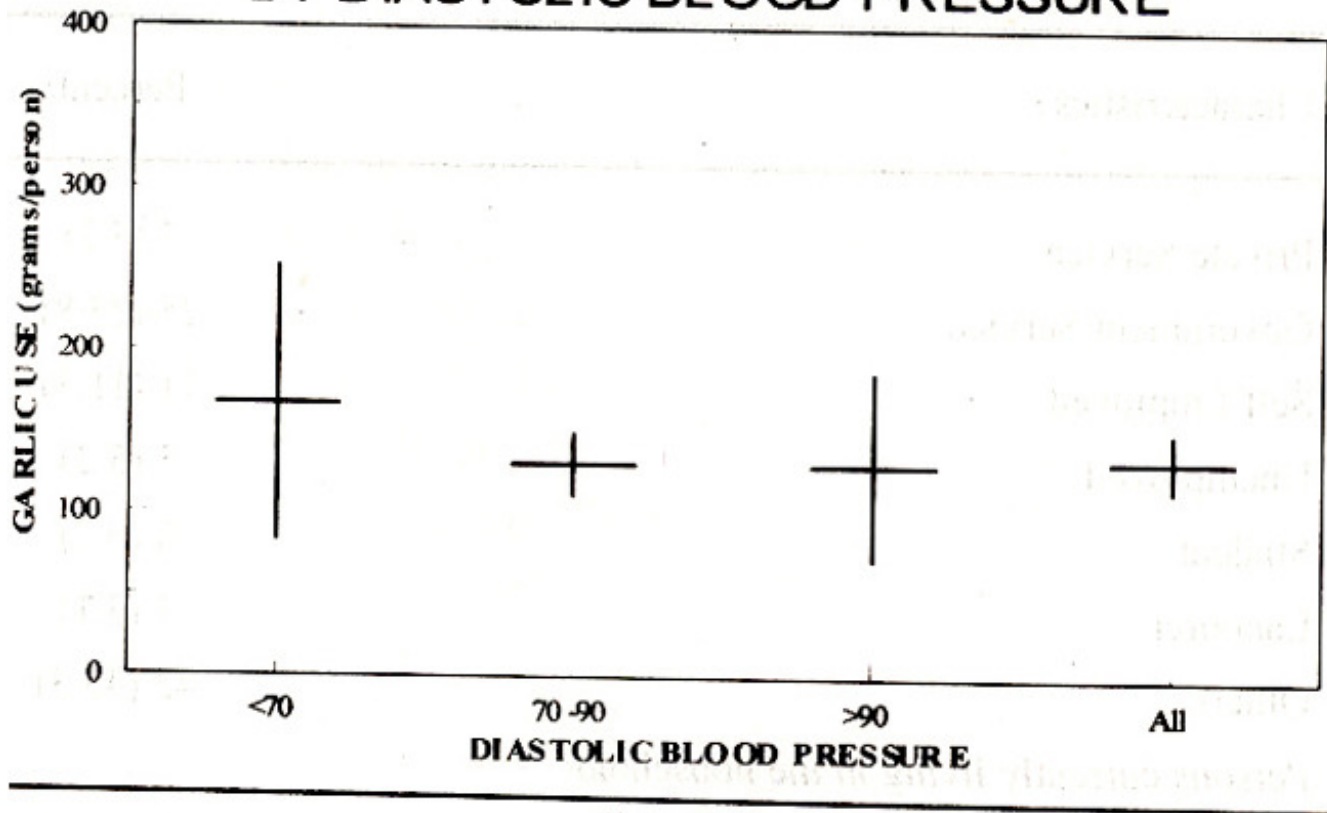


Figure 2.

Because of study design, we could not see age as significant confounder in the study for blood pressure.

### Discussion

The evidence for the beneficial effect of garlic use on blood pressure is lacking<sup>3</sup>. Hypertension is a common chronic disease with significant adverse health and economic consequence for the patient and the health care delivery systems. A cheap and simple measure such as the increased use of garlic in the diet, if proven to be effective may go a long way in reducing morbidity and mortality from this chronic condition in the developed and the developing countries. However, we must not forget that the possibility of toxicity resulting from acute and chronic ingestion of large amounts of garlic remains unresolved'. Further studies are needed in this area.

The use of herbal therapies is on the rise in the United States. Potentially safe herbs include garlic for hypertension, hyperlipidaemia and infections<sup>6</sup>. We expect the use of garlic to go up in the developing countries as well and therefore evaluating the place for the use of garlic in prevention and treatment of hypertension needs validation.

In an interventional study the supine diastolic blood pressure in the group having garlic treatment fell from 102 to 91 mmHg after eight weeks ( $p < 0.05$ ) and to 85 mmHg after 12 weeks ( $p < 0.01$ ). No significant change was observed in the placebo group<sup>7</sup>. Because of small sample size, the conclusions of the study stand disputed.

Another interventional study conducted in rats indicate that garlic is effective as a natural agent for the treatment of hypertension, and reduces systolic blood pressure markedly<sup>8</sup>.

The effects of long-term dietary application of garlic or linseed oil as well as a combination of both



interventions were studied on the life span of hypertensive rats. The systolic blood pressure was significantly lowered by both garlic (mean 5.8 mmHg). linseed oil (mean 6.3 mmHg) and their combination (mean 11.3 mmHg)<sup>9</sup>. This needs validation in human subjects.

Garlic indirectly effects atherosclerosis by reduction of hyperlipidemia, hypertension. and probably diabetes mellitus and prevents thrombus formation<sup>10</sup> Standardized preparations guarantee exact dosing and minimize the problem of the strong odor of raw garlic<sup>11</sup> A garlic preparation containing 1.3% allicin at a large dose (2400mg) was given to nine patients with diastolic blood pressure > 115 mmHg. A significant fall in diastolic blood pressure ( $P < 0.05$ ) was noted<sup>12</sup>

All of the studies quoted so far have failed to conclusively prove that the dietary use of garlic has any effect on the blood pressure in humans. This has been a pilot study. The manner in which the dietary intake of garlic has been estimated is crude and the sample size may not be sufficient enough to draw statistical conclusions with certainty, but the results do show a favorable impact of dietary use garlic on blood pressure in humans. Despite extensive research on the role of garlic intake on blood pressure in humans, our finding suggests and we strongly recommend further trials in this interesting and promising area of herbal medicine.

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